

# Independent Peer Review Group

*A multi-agency panel of seismic hazard specialists  
established by the California Public Utilities Commission*

CALIFORNIA GEOLOGICAL SURVEY, CALIFORNIA COASTAL COMMISSION  
CALIFORNIA GOVERNOR'S OFFICE OF EMERGENCY SERVICES,  
CALIFORNIA ENERGY COMMISSION, CALIFORNIA SEISMIC SAFETY COMMISSION,  
CALIFORNIA PUBLIC UTILITIES COMMISSION

## IPRG Report No. 2, July 17 2013

### SONGS Seismic Projects Update and IPRG Support for Continuing Seismic Studies

On July 11, 2013 the Independent Peer Review Group (IPRG) met with representatives of Southern California Edison (SCE) and the California Public Utilities Commission (CPUC) regarding the seismic research studies in the vicinity of the San Onofre Nuclear Generating Station (SONGS). The purpose of the meeting was for SCE to present a status report for the current and planned SONGS seismic research projects. This discussion was timely given SCE's June 7, 2013 decision to decommission SONGS, thus ending its role as a power generating facility in California. The decision to close the plant calls into question the necessity of continuing the seismic research studies authorized by the CPUC as recommended in the AB1632 report by the California Energy Commission (CEC). This letter summarizes the status of these projects, and discusses the value of continuing the planned studies both to the SONGS facility, as well as to seismic hazard assessments in the region.

#### SCE Seismic Research Projects Status

Since the previous IPRG meeting with SCE (summarized in IPRG Report No.1), considerable progress has been made by several of the research projects, some of which are complete, or are nearing completion. The following projects were described by SCE as those that are completed, or there are plans to complete the work:

1. Paleoseismic Trenching: The work is complete and a report is available. This work provides information regarding the timing and frequency of surface-rupturing earthquakes on the Newport Inglewood – Rose Canyon (NI-RC) fault system in the vicinity of San Diego.
2. Marine Terrace and Coastal Deformation Investigations: This work is nearly complete and there are plans to complete this work. This work is intended to provide uplift rates of marine terraces for use in regional models of coastal deformation.
3. GPS Monitoring: Eight continuous GPS stations have been installed, with an additional 5 stations planned. These stations will complement the existing network in southern California and, given enough time, provide better resolution of current rates of deformation in the vicinity around SONGS. There are plans to complete this work.

4. Seismic Monitoring: A single station was installed at SONGS and is monitored by the USGS. This installation is intended to provide site-specific response data for ground motions at SONGS.
5. Historical Marine Geophysical Data Reprocessing and Reanalysis: A major effort is underway to reprocess and interpret a total of 51 seismic lines from the 1979 Chevron and 1987 JEBCO surveys. Initial results from this effort show substantial improvements are achieved by reprocessing these data, and these data provide important insights into the large-scale geometry, deformation history, and kinematic relationship of the Oceanside Blind Thrust (OBT) and NI-RC fault systems. These data will be used to modify and update proponent tectonic models in the ongoing Senior Seismic Hazard Analysis Committee (SSHAC) process. Furthermore, the acquisition of the formerly “lost” 1987 JEBCO geophysical data provides insights into the utility of collecting additional high-energy 2D and 3D geophysical data in the vicinity of SONGS. These 1987 surveys, collected using techniques similar to what are employed today, have difficulty imaging deeper crustal structure below the top of the Catalina schist. Based on this, it appears unlikely that additional 2D and 3D high energy surveys will improve on this, making these studies unlikely to contribute to our understanding of the deeper geometry of the OBT and NI- RC fault systems. There are plans to complete the reprocessing and interpretation of the Chevron and JEBCO data.

Several planned studies were described by SCE as “Work under review”, that is, due to the closure of SONGS as a power generating facility, this work may no longer be necessary under the recommendations of the AB1632 Report, but may still be of value to SCE for maintaining SONGS during the decommissioning process. These projects and their possible benefits are:

1. Low Energy 2D Marine Acoustic Surveys: The 2D surveys are intended to identify potential targets for the more detailed 3D surveys. The targets are structures such as small basins and offset channels that, when used in conjunction with the results of the seafloor sampling and age dating task, are intended to provide slip rates, as well as frequency and timing of large earthquakes. Planned bathymetric surveys are concurrent with the 2D and 3D surveys and will aid in the mapping of active structures on the seafloor. Work under review by SCE.
2. Low Energy 3D Marine Acoustic Surveys: The detailed 3D surveys will follow the 2D surveys, and will help define feature geometries from which absolute amounts of deformation can be measured (such as the amount of offset on a displaced channel or marker horizon). This data will likely have 1-2 m resolution, which is needed to resolve shallow deformation. This shallow deformation likely represents Late Pleistocene-Holocene rates of activity, which is thought to be the most relevant for use in seismic hazard analysis. Work under review by SCE.
3. Focused Low Energy 2D Surveys by USGS: Work under review by SCE.
4. Seafloor Sediment Sampling and Age Dating: This work represents the final data collection step for defining rates of seismic activity by providing age constraints for features offset or deformed by seismic activity. Work under review by SCE.
5. Scripps/UNR Data Acquisition and Processing: This work supports management and data analysis of the 2D and 3D surveys. Work under review by SCE.

6. Seismic Monitoring: Some ocean bottom seismometers (OBS) have been procured and the deployment of the temporary OBS campaign is scheduled to coincide with the low energy 3D survey, currently scheduled for October 2013. The OBS network will provide data regarding the location and distribution of microearthquakes in the offshore vicinity of SONGS, potentially providing additional constraints on the location of active structures and possibly identifying additional seismically-active structures that are, as yet, unknown. In addition, data from the ocean bottom seismometers may help accumulate near site ground motion recording that may be used in assessing seismic hazard with respect to the continued operation of the spent fuel pool and the ISFSI.

## Summary

In summary, the low energy 2D, 3D, bathymetric studies, and seafloor sampling projects are intended to provide new data regarding the OBT and NI-RC fault systems, of which little is currently known in terms of detailed structure and rates of activity. Given that much of this work is already contracted, and the data collection activities are already scheduled during the next few months, the IPRG feels there are substantial benefits of bringing this work to completion. Such data will aid in reducing uncertainty in the evaluation of seismic hazards at the plant. Furthermore, the results of these studies may contribute to the ongoing NRC 50.54(f) related projects through a better understanding of seismic hazards in the vicinity of SONGS, including an updated seismic source model. Although SCE is decommissioning the nuclear reactors, other facilities such as spent fuel ponds (SFP) and dry cask storage will remain at the site indefinitely and may be at risk from future earthquakes, thus a better understanding of the regional seismic hazards contributes directly to the safety of those facilities.

With respect to the 2D, 3D, age dating, and bathymetric studies, the IPRG notes the interrelated and complementary nature of these studies, in that a number of them are timed to coincide with other data collection activities. For example, bathymetry will be collected at the same time as the 2D seismic studies are being conducted and the deployment of the OBS network coincides with the 3D studies. Furthermore, some of these studies are dependent on other studies having already taken place. For example, although the 2D and 3D studies will provide information regarding the absolute amounts of deformation, rates of activity critical to the seismic hazard analysis will need the seafloor sediment sampling and age dating activity in order to provide constraints on the timing of deformation. Given the substantial investment in procuring ship time and instrumentation, we recommend that all aspects of the 2D and 3D studies and related work are completed. Without a comprehensive investigation, the incomplete seismic studies are of limited value.

In conclusion, the IPRG finds value in the completion of the seismic projects described above in that they contribute directly to the assessment of seismic hazards at SONGS, and are also of value to regional seismic hazard assessments such as those conducted by the USGS. The IPRG hopes that this perspective on the value of continuing the planned studies helps SCE and the CPUC weigh the benefits of these research projects.